The importance for wellbeing of having views of nature from and in the home during the COVID-19 pandemic. Results from the GreenCOVID study

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ABSTRACT

Introduction: The COVID-19 pandemic has influenced the daily lives of people and may affect their well-being. The aim of the present study is to assess well-being and associated factors during the first wave of the COVID-19 pandemic in the general population in three European countries.

Methods: GreenCOVID was an observational cross-sectional study using an online survey (7 April 2020 to 24 July 2020) promoted by the Health & Territory Research (HTR) of the University of Seville in Spain, Maynooth University in Ireland, and the University of Winchester in England, which included a sample of 3109 unselected adults. Well-being was measured using the World Health Organization-Five Well-Being Index (WHO-5) scale. Seven aspects, related to the natural environment of the home, were evaluated (role of outdoor views in coping with lockdown, importance of blue spaces during lockdown, importance of green spaces during lockdown, quality of view from home, use of outdoor spaces or window views, elements of nature in the home, and views of green or blue spaces from home). Binary logistic regression was conducted to identify the parameters associated with poor well-being.

Results: Mean age was 39.7 years and 79.3% lived in Spain, the majority in urban areas (92.8%). 73.0% were female and 72.0% had undertaken university studies. Poor well-being was reported by 59.0%, while 26.6% indicated the possible presence of clinical depression. The factors most associated with poor well-being were students (OR = 1.541), those who had no engagement in physical activity (OR = 1.389), those who reported 'living in Spain' compared to Ireland (OR = 0.724), being female (OR = 1.256), poor quality views from home (OR = 0.887), less benefit from views of the natural environment to cope with lockdown (OR = 0.964), and those younger in age (OR = 0.990).

Conclusions: More than half of participants reported poor well-being and one in four indicated the possible presence of clinical depression during the first wave of the COVID-19 pandemic. We identified that belonging to a younger age cohort, being a student, being female, not being able to continue with daily pursuits such as physical activity, and having poorer quality of views from home led to poor well-being among participants. Our study highlights the importance of continued physical activity and views of nature to improve the well-being of individuals during times of crisis such as the COVID-19 pandemic.

1. Introduction

SARS-Cov-2 is a new type of severe respiratory coronavirus, which spreads rapidly from person-to-person resulting in a pandemic with devastating lethal effects (Wang et al., 2020). On 11 March 2020, the World Health Organization declared the novel coronavirus (COVID-19) outbreak a global pandemic (World Health Organization, 2020). The SARS-Cov-2 virus emerged in Wuhan (China), but quickly spread to the

European continent hitting first Italy and later Spain, where the highest mortality rates from the first wave of the pandemic in Europe were observed (Ceylan, 2020). More recent reports of the highest COVID-19 mortality in Europe indicate that Hungary and the Czech Republic have experienced the highest numbers, with Italy now in seventh place and Spain in eleventh (Statista, 2021). The COVID-19 pandemic is having ongoing social and economic consequences all around the world due to the public health restrictions put in place by affected countries. These consequences were reflected in the closure of restaurants, businesses and all non-essential activities, limiting the socialization of people and damaging national economies (Bonaccorsi et al., 2020; Usman, Ali, Riaz, Riaz, & Zubair, 2020). In addition, mistrust of COVID-19 vaccines and concerns about side-effects, continue to raise fears for the future (Paul, Steptoe, & Fancourt, 2021).

One important consequence of the pandemic has been its impact on psychological well-being at a global level. In this sense, a study by Khan et al. (2021) showed a high prevalence of poor well-being in the general Pakistani population during the COVID-19 pandemic (41.2%), with females, unemployed people and people with a chronic illness associated with poor well-being. In Denmark, poor well-being was directly related to high levels of anxiety and depression (Sønderskov, Dinesen, Santini, & Østergaard, 2020). Another UK study showed a significant association between young people and poor well-being during the pandemic (O'Connor et al., 2020), while a study of Italian students identified they were more likely to show depressive symptoms (Marelli et al., 2021).

While the effects of COVID-19 pandemic are a major component in shaping emotional well-being, there were other additional factors, such as lower levels of physical activity, associated with reduced well-being during the pandemic. In this context, several studies have illustrated significant associations between physical inactivity and poor well-being (Hu, Lin, Kaminga, & Xu, 2020; Lesser & Nienhuis, 2020). With respect to other unhealthy lifestyle habits, research by Yang and Ma (2021) showed that smokers who reduced their tobacco consumption during the pandemic experienced greater emotional well-being. Furthermore, increased alcohol consumption during the pandemic period was significantly associated with poor well-being and the presence of depressive symptoms (Jacob et al., 2021).

Another important aspect to consider during the COVID-19 pandemic was contact with nature. In this vein, a study published by Corley et al. (2021) found that the use of private gardens was associated with positive well-being during the pandemic. In addition, having indoor plants was associated with positive emotions, with confined inhabitants spending more time maintaining their plants (Pérez-Urrestarazu et al., 2021). Furthermore, according to Lehberger, Kleih, and Sparke (2021), people with their own gardens had a substantially higher level of self-reported well-being than those without a garden. Contact with nature reduced the impact of the pandemic on people's mental health, with more positive well-being found among those with accessible outdoor spaces and those with views of green or blue spaces (Pouso et al., 2020). In this sense, Garrido-Cumbrera et al. (2021) showed that perceived improvements in external environmental elements during the COVID-19 pandemic were associated with better self-reported health status and well-being.

It is important to note, however, that these arguments connecting nature and well-being have been demonstrated long before the COVID-19 pandemic, as White, Pahl, Wheeler, Depledge, and Fleming (2017) identified an association between frequency of visits to nature and a positive state of well-being. Indeed, greater proximity to, and quantity of, nature was associated with better well-being (Bertram & Rehdanz, 2015). In general, higher levels of visual interactions with nature can also have positive effects on health and well-being (Grinde & Patil, 2009). In this sense, Braçe et al. (2020) found that people who enjoyed views of green spaces from their homes had a lower risk of anxiety and depression. Furthermore, earlier studies showed that residential views of nature improved neighborhood satisfaction and well-being (Kaplan, 2001; Kearney, 2006). However, views of nature are not only beneficial

for homes, but also can increase the satisfaction of office workers (Gilchrist, Brown, & Montarzino, 2015), and improve the mental health of students in schools with better views (Dzhambov, 2018), and benefit the health status of patients in hospitals (Ulrich, 1984).

The present study aims to identify associations between people's well-being and their socio-demographic profile, lifestyle habits, and relationship with nature during the first wave of the COVID-19 pandemic. It uses data from the GreenCOVID study, conducted in Spain, England, and Ireland. Views from home may play an important role in coping with lockdowns enforced due to COVID-19. Therefore, the present study evaluates seven aspects related to natural environments associated with participants' homes: 1) Outdoor views as aid in coping with lockdown; 2) Perception of the importance of blue spaces during lockdown; 3) Perception of the importance of green spaces during lockdown; 4) Quality of views from home; 5) Use of outdoor spaces or window views; 6) Natural elements in the home; 7) Availability of a view of green or blue spaces from home.

2. Materials and methods

2.1. Survey

GreenCOVID was a cross-sectional online survey of unselected adults (>16 years). This survey aimed to assess the impact of the first wave of COVID-19 and its containment measures on the well-being and mental health of the population in three European countries: Spain, Ireland, and England. The questionnaire was initially designed by members of the Health & Territory Research (HTR) group of the University of Seville for respondents in Spain and included the following domains: socio-
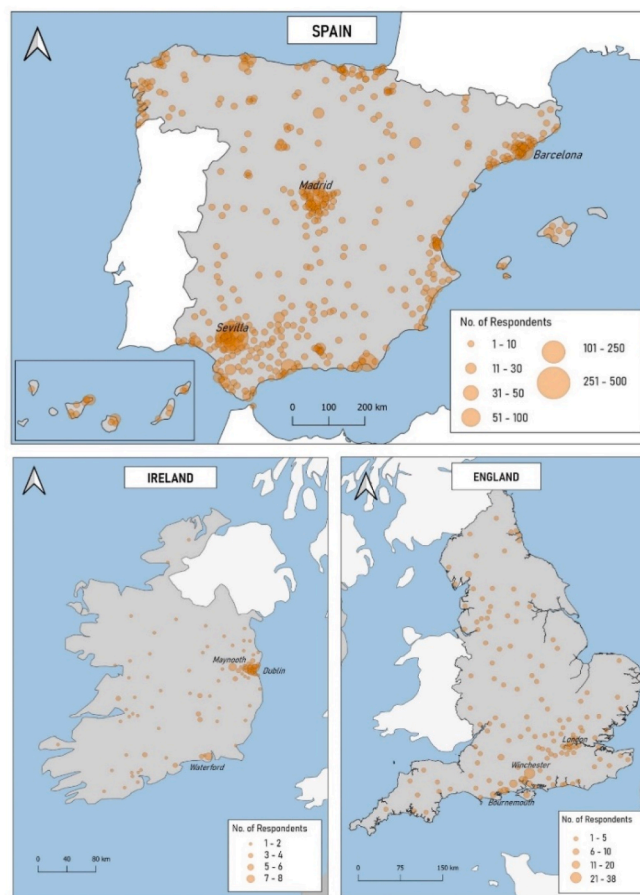

Fig. 1. Distribution of GreenCOVID survey respondents in Spain, Ireland, and England.

demographic, home/housing, behaviors and routines, outdoor contact, well-being, physical health, and mental health. It was subsequently translated and adapted for dissemination in Ireland and England.

The survey was first disseminated in Spain (from 7 to 25 April 2020) by the Press Office of the University of Seville and the Spanish Association of Geography (AGE), then in England (from 28 May to 24 July 2020) by the PeopleScapes Research Group at the University of Winchester, and finally in Ireland (from 3 June to 1 July 2020) by Maynooth University. 4078 participants accessed the survey, although 951 participants were excluded in the database cleaning process for not having completed at least 70% of the survey. As a result, 3109 unselected adults from the general population participated in the final sample from April to June 2020. Participants in the GreenCOVID survey are spatially represented by Local Administrative Units in each of the three countries (Fig. 1).

2.2. Variables

An overview of the variables used in the analyses is presented in Table 1.

2.3. Well-being measures

The World Health Organization-Five Well-Being Index (WHO-5) is a short, self-reported measure of current psychological well-being. The WHO-5 index is suitable for people 9 years-old or more and has been translated into more than 30 languages. The WHO-5 index consists of five statements: 1. I have felt cheerful and in good spirits; 2. I have felt calm and relaxed; 3. I have felt active and vigorous; 4. I woke up feeling fresh and rested; 5. My daily life has been filled with things that interest me. Respondents are asked to rate their answers according to the following scale (in relation to the past two weeks): all of the time (5), most of the time (4), more than half of the time (3), less than half of the time (2), some of the time (1), and at no time (0) (see Figure A1). The total raw score, ranging from 0 to 25, is multiplied by 4 to provide the final score, with 0 representing the worst imaginable well-being and 100 representing the best imaginable well-being (World Health Organization, 1998). WHO-5 values $\leq$ 50 are defined as identifying poor well-being, while WHO-5 values $\leq$ 28 are defined as identifying the possible presence of clinical depression (Topp et al, 2015). For our analyses, two binary variables were derived from the WHO-5 values. The first divided participants into two groups: people with poor and good well-being. Meanwhile, the second variable divided respondents among those with or without the possible presence of clinical depression. The group defined as having poor well-being thus encompassed all respondents with WHO-5 scores below 50, including those with possible clinical depression ($\leq$28) and those with moderately poor well-being (28–50), while the cohort without possible clinical depression encompassed all participants with WHO-5 scores above 28, including those with scores in the 28–50 range who had moderately poor well-being and those who had good well-being (>50).

2.4. Statistical analysis

A descriptive analysis of all variables was performed showing the percentage for categorical variables and the mean (±SD) for continuous variables. The Mann-Whitney test was used to analyze the distributions of the continuous variables (age, outdoor views in coping with lockdown, importance of blue spaces during lockdown, importance of green spaces during lockdown, and quality of view from home) against the first

Table 1
Description of the variables used in the study.

Domains	Variables	Questions
1) **Socio-demographic characteristics**	- **Age** (in years) - **Country** (Spain/England/Ireland) - **Area** (Urban/Rural) - **Gender** (Male/Female) - **Educational level** (Primary schooling/Secondary/High school/University) -**Job status** (Employed/Unemployed/Student/Retired or Early retirement/Homemaker/Sick leave/Furloughed)	- What year were you born? - Where do you live? (Country) - Where do you live? (City, Town, or County) - Please indicate your gender. - Please indicate your level of completed studies. - Please specify your current work situation.
2) **Life habits**	-**Physical activity during lockdown** [Yes (including: every day, 4–6 times per week, 3 or less times per week or once per month)/No (including: never)] - **Alcohol consumption during lockdown** (Not or decreased/Same/Increased) - **Smoking consumption during lockdown** (None or decreased/Same/Increased)	- During lockdown, how often do you currently engage in physical activity? - Currently, during lockdown, has your alcohol consumption increased? - Has your smoking increased during lockdown?
3) **Well-being**	- **WHO-5** (Poor well-being/Good well-being)	- Please indicate for each of the five statements which is closest to how you have been feeling over the last two weeks. Notice that higher numbers mean better well-being (See Figure A1).
4) **Depression**	- **WHO-5** (Possible presence of clinical depression/No possible presence of clinical depression)	
5) **Environmental elements**	- **Outdoor views help in coping with lockdown** (0–10: 0 being of no help and 10 the most help) - **Importance of blue spaces during lockdown** (0–10: 0 being not important and 10 very important) - **Importance of green spaces during lockdown** (0–10: 0 being not important and 10 very important) - **Quality of view from home** (0–10: 0 being the worst quality and 10 the best) - **Use of outdoor spaces or window views** [Yes (including rooftop, terrace, balcony, patio, courtyard and spaces with views from the window)/No (including not using them, don't have them and not allowed to use them)] - **Nature element in home** [Yes (including trees, flowerpots with plants, garden, grass and orchard)/No (including: none of the above)] - **View of green or blue spaces from home** [Yes (including green or blue views from the windows or balcony of the bedroom, lounge/dining room or kitchen)/No (including: no green or blue views from window, balcony bedroom, lounge/dining room or kitchen)	- Assess the extent to which being in/seeing/hearing the outdoors is helping you cope with lockdown. - Currently, during lockdown, how would you define the importance of views of the sea, rivers, lakes, springs or reservoirs? - Currently, during lockdown, how would you define the importance of being able to see and/or hear green areas, for example parks, gardens, forests, nature in general? - How would you evaluate the views from your home? (0 being the worst quality and 10 the best quality) - Currently, during lockdown, are you using any of the following locations in your home? (rooftop, terrace, balcony, patio, courtyard and spaces with views from the window/No) - Does your home have any of the following elements? (trees, flowerpots with plants, garden, grass and orchard)/No) - From the window or balcony of your a) bedroom, b) lounge/dining room c) kitchen, what views do you have?

dichotomous dependent variable 'well-being' (good well-being >50 and poor well-being ≤50). The Pearson's Chi-square test was used to analyze the relationship between the same dichotomous dependent variable, well-being (good well-being >50 and poor well-being ≤50) and identified categorical variables (country, area, gender, educational level, job status, physical activity, alcohol consumption, smoking consumption, unemployment, use of outdoor spaces or window views, natural elements in the home, and view of green or blue spaces from home). Binary logistic regression was then used to evaluate the presence of the first binary, poor well-being variable (0 = good well-being; 1 = poor well-being) and the second, possible presence of clinical depression variable (0 = no possible presence of clinical depression; 1 = possible presence of clinical depression), based on cut-off score above and below 28, against an identified set of independent variables: 1) Age in years; 2) Country: England and Ireland compared to Spain; 3) Female gender; 4) Students; 5) No engagement in physical activity during lockdown; 6) Increased alcohol consumption; 7) Increased smoking; 8) Outdoor views help in coping with lockdown (0–10); 9) Importance of blue spaces during lockdown (0–10); 10) Importance of green spaces during lockdown (0–10); 11) Quality of view from home (0–10); 12) No use of outdoor spaces or window views; 13) Lack of a natural element in the home; and 14) No view of green or blue spaces from the home. In the binary logistic regression, Odd Ratios (ORs) and 95% confidence intervals (CI) were shown.

All statistical analyses were performed using SPSS version 26.0.

3. Results

3.1. Descriptive statistics

The mean age of our study population was 39.7 years. Of the participants 79.3% lived in Spain, the majority in urban areas (92.8%), while 73.0% were female, 72.0% had undertaken university studies, with 49.1% employed and 9.6% unemployed. During lockdown, 81.6% were physically active, while 22.3% noted increased their consumption of alcohol and 11.8% reported increased levels of smoking. According to the WHO-5 scale, 59.0% experienced poor well-being and 26.6% had scores indicating the possible presence of clinical depression. Outdoor views helped individuals to cope with lockdown, scoring on average 6.3 (out of 10); while the perceived importance of views of blue spaces had an average score of 7.9 (out of 10), while the perceived importance of views of green space was ranked at 8.6 (out of 10). Furthermore, participants collectively rated their view from home at an average of 5.8 (out of 10). 84.1% of participants used outdoor spaces or window views during lockdown and 73.5% had identifiable nature elements in the

home, while overall, 48.6% indicated having a specific view of green or blue space from their home during the pandemic (Table A1).

3.2. Preparatory analyses

Compared to people with good well-being, those with poor well-being were more frequently younger (37.6 vs 42.4 years, p < 0.001), lived in Spain (62.1% vs 47.2% in England and 44.8% in Ireland, p < 0.001), were female (60.8% vs 54.3% of males, p = 0.001), were students (71.4% vs 55.4% of employees, p < 0.001), were not physically active (68.1% vs 57.0%, p < 0.001), did not consume alcohol or had decreased their consumption (62.8% vs 51.1% of same as before, p < 0.001), and had increased smoking (65.8% vs 57.9% who did not smoke or reduced their tobacco consumption, p = 0.016; Table A2).

Participants with poor well-being were helped less by views of the outside in coping with lockdown (5.7 vs 7.0 out of 10, p < 0.001). Moreover, they placed less value on the quality of views from the home (5.3 vs 6.5 out of 10, p < 0.001). Compared to respondents with good well-being, participants with poor well-being had less access to outdoor spaces or window views (71.5% vs 28.5%, p < 0.001), natural elements at home (65.8% vs 34.2%, p < 0.001), and views of green or blue spaces from the home (65.3% vs 34.7%, p < 0.001; Table A2).

3.3. Hypothesis tests

In the univariate logistic regression analysis, factors associated with poorer well-being were being younger in age (OR = 0.975), living in Spain compared to England (OR = 0.544) and Ireland (OR = 0.668), female gender (OR = 1.312), students (OR = 1.968), no engagement in physical activity (OR = 1.614), decrease or same level of alcohol consumption (OR = 0.946), increased smoking (OR = 1.084), less support derived from views from home during confinement (OR = 0.888), worse quality views from home (OR = 0.838), not use of outdoor spaces and window views (OR = 1.913), lack of natural elements in the home (OR = 1.484), and the absence of green and blue space views from home (OR = 1.709). When all variables were included in the multivariate logistic regression model, the categorical variables with the greatest association with poor well-being were students (OR = 1.541), no engagement in physical activity (OR = 1.389), those living in Spain compared to Ireland (OR = 0.724), and female (OR = 1.256). The continuous variables with the greatest association with poor well-being were worse quality of views from home (OR = 0.887), less help derived from views to cope with lockdown (OR = 0.964) and being younger (OR = 0.990; Table 2).

Most of the significant variables in the multivariate logistic regression for well-being were statistically significant in the same direction for

Table 2
Binary logistic regression to predict the factors associated with poor well-being during the COVID-19 lockdown (N = 3010)*OR < 1 indicates a decrease in the likelihood of poor well-being; OR > 1 equals to an increase the likelihood. OR= Odds ratio; CI = Confidence Interval.

Variables	Univariate logistic regression		Multivariate logistic regression	
	OR*	CI (95%)	OR*	CI (95%)
Age	0.975	**0.970, 0.980**	0.990	**0.983, 0.997**
Country. England	0.544	**0.435, 0.681**	0.827	0.632, 1.081
Country. Ireland	0.668	**0.512, 0.871**	0.724	**0.536, 0.977**
Gender. Female	1.312	**1.116, 1.541**	1.256	**1.057, 1.493**
Job status. Student	1.968	**1.619, 2.392**	1.541	**1.205, 1.971**
Physical activity during lockdown. No	1.614	**1.329, 1.959**	1.389	**1.131, 1.706**
Alcohol consumption during lockdown. Increased	0.946	**0.905, 0.989**	1.015	0.966, 1.066
Smoking consumption during lockdown. Increased	1.084	**1.026, 1.146**	1.028	0.968, 1.091
Help derived from outdoor views to cope with lockdown (0–10)	0.888	**0.868, 0.909**	0.964	**0.936, 0.993**
Quality of view from home (0–10)	0.838	**0.814, 0.862**	0.887	**0.854, 0.921**
Use of outdoor spaces or window views. No	1.913	**1.547, 2.365**	1.141	0.899, 1.448
Nature element in home. No	1.484	**1.255, 1.755**	0.996	0.825, 1.202
View of green or blue spaces from home. No	1.709	**1.477, 1.976**	1.029	0.862, 1.228

Table 3

Binary logistic regression to predict the factors associated with the possible presence of clinical depression during the COVID-19 lockdown (N = 3010)*OR < 1 indicates a decrease in the likelihood of possible presence of clinical depression; OR > 1 equals to an increase likelihood. OR= Odds ratio; CI = Confidence Interval.

Variables	Univariate logistic regression		Multivariate logistic regression	
	OR*	CI (95%)	OR*	CI (95%)
Age	0.980	**0.974, 0.986**	0.999	0.991, 1.007
Country. England	0.579	**0.437, 0.767**	0.871	0.624, 1.215
Country. Ireland	0.733	0.534, 1.007	–	–
Gender. Female	1.221	**1.015, 1.470**	1.230	**1.001, 1.497**
Job status. Student	1.908	**1.577, 2.309**	1.779	**1.385, 2.286**
Physical activity during lockdown. No	2.025	**1.669, 2.455**	1.823	**1.486, 2.235**
Alcohol consumption during lockdown. Increased	0.941	**0.894, 0.989**	0.998	0.944, 1.054
Smoking consumption during lockdown. Increased	1.091	**1.030, 1.155**	1.034	0.972, 1.101
Outdoor views help in coping with lockdown (0–10)	0.888	**0.867, 0.909**	0.954	**0.925, 0.984**
Quality of view from home (0–10)	0.844	**0.819, 0.870**	0.898	**0.862, 0.936**
Use of outdoor spaces or window views. No	1.850	**1.508, 2.271**	1.095	0.866, 1.383
Nature element in home. No	1.550	**1.301, 1.848**	1.122	0.921, 1.368
View of green or blue spaces from home. No	1.604	**1.363, 1.888**	1.016	0.834, 1.238

the possible presence of clinical depression (female gender, student, no physical activity, outdoor views that helped participants to cope with confinement, and quality of view from home), with only age and country identified as non-significant factors (see Table 3).

4. Discussion

In our study, during the first wave of the COVID-19 pandemic, poor psychological well-being was prevalent in more than half of the respondents (59.0%) and just over one in four had the possible presence of clinical depression (26.6%). Poor well-being was specially associated with a younger age cohort, female respondents, students, individuals who were not physically active and those living in Spain and also associated with poor quality of views from home and less perceived help from such views in coping with the lockdown. These significant associations were also found for the more severe measure of possible presence of clinical depression, except for age and country variables.

Our results showed that more than half of participants (59.0%) experienced poor well-being during the first wave of the pandemic. These results were higher than those reported by Khan et al. (2021), which rated the prevalence of poor well-being at 41.2% during the same pandemic period in Pakistan. In addition, we found that one in four participants (26.6%) had scores indicating possible presence of clinical depression, with a higher prevalence for females (27.6%) compared to males (23.8%). These results were in line with the UK study conducted by O'Connor et al. (2020) which also showed a higher level of clinical depression for females compared to males (33.0% vs. 17.6%). Interestingly, there was a higher prevalence of poor well-being in Spain (62.1%) than in England (47.2%) and Ireland (44.8%). This may have been due to the greater impact of the pandemic and the more severe restrictions in place in Spain (Garrido-Cumbrera et al., 2021), compared to the less restrictive environments of Ireland and England during the data collection period in those countries.

Our study showed an association between those of younger age and students with both poor well-being and the possible presence of clinical depression scores; consistent with O'Connor et al.'s (2020) study in which younger age ranges demonstrated poorer well-being and clinical depression compared to older age groups. Marelli et al. (2021) also showed that students were more likely to experience clinical depression during the pandemic. This may be explained by the fact that during the first wave of the pandemic many schools, across all three countries, had to close and move classes online (Donohue & Miller, 2020). Consequently, students were confronted with a new form of learning and knowledge assessment, and significantly reduced socialization, changes that could lead to poorer well-being and the onset of depressive symptoms (Tang, Xiang, Cheung, & Xiang, 2021).

With respect to interruptions to wider lifestyle habits, our results showed a relationship between physical inactivity, poor well-being, and the possible presence of clinical depression during the pandemic. These results were consistent with other studies in which physical inactivity was associated with poor well-being during the pandemic (Hu et al., 2020; Lesser & Nienhuis, 2020). In addition, Maugeri et al. (2020) showed that a reduction in physical activity had a profoundly negative impact on psychological health and well-being of the Italian population more broadly. For those physically active cohorts - who would generally be among the most productive in society - and for whom that physical activity was also often associated with socialization, the enforced confinement and isolation had a double negative effect.

In considering the home environment of respondents, we found an association between more limited help derived from views of nature from the home in coping with lockdown with poor psychological well-being and the possible presence of clinical depression. Similarly, Pouso et al. (2020) found that people under strict lockdowns perceived that having green or blue views from the home was associated with positive emotions. Additionally, Pérez-Urrestarazu et al. (2021) identified that having natural elements in the home such as plants or trees, positively influenced well-being during lockdown. Similarly, Lehberger et al. (2021) found that respondents with their own garden reported higher levels of self-perceived well-being during the pandemic than those who did not have a garden. Our sample found that poor quality of views from home during the pandemic was associated with both poor well-being and the possible presence of clinical depression. Consistently, Braçe et al. (2020) found that people who enjoyed a view of green spaces from home had a lower risk of anxiety and depression.

One of the strengths of our study is the large sample size gathered in three European countries during the most stringent period of the first wave of the COVID-19 pandemic, when most of the population was prevented from leaving their homes (in the case of Spain) or could only move within certain catchment areas (in Ireland and England). In the present study, factors associated with poor psychological well-being and the possible presence of clinical depression during the first wave of the pandemic were analyzed, including socio-demographic characteristics, lifestyle, and family environment. Moreover, the home's natural environment was evaluated based on seven different factors. One limitation of the study was that the sample was mainly from Spain (n = 2,464, 79.3%), compared to the UK (n = 402, 12.9%), and Ireland (n = 243, 7.8%), so the results cannot be generalized to the general population in these three countries. Furthermore, these data are not generalizable due to the use of convenience sampling, pragmatically used to collect a large sample in a short period of time to assess the immediate impact of the pandemic. Another limitation concerned the different survey periods in each country, since the different times and various lockdown policies adopted by the governments of each of the three countries may have affected the results. An additional limitation was the variability in responses to variables such as the quality of the view or natural elements since, being self-reported responses using a scale of 0–10 points, no specific cut-off point was included that would have increased the sensitivity and comparability of the responses. Furthermore, because of the cross-sectional nature of the study, it was not possible to establish

cause-effect relationships and, therefore, the results should be interpreted with caution. Finally, gender differences should also be interpreted with care due to the over-representation of the female gender in the sample.

5. Conclusion

During the first wave of the COVID-19 pandemic, more than half of the participants of the GreenCOVID survey reported poor well-being and, in addition, one in four had scores indicating the possible presence of clinical depression. Belonging to a younger age cohort, being a student, being female, physically inactive, or not having a high-quality view of nature from home were all associated with poor well-being and depressive symptoms among participants. It is important to continue to assess the impact of the evolving pandemic on psychological well-being to potentially prevent more serious physical and mental health problems in later years. Healthy behavioral guidelines should be developed to help combat more efficiently physical diseases and mental disorders during crises that threaten human well-being and health, such as the pandemic, but also beyond them, especially in relation to the role that green and blue spaces can play. Our study also highlighted the importance of continued physical activity in and views of nature from the home as important public health assets to improve the well-being and mental health in times of crisis.

Author contributions

All authors: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Roles/ Writing - original draft; Writing - review & editing.

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The WHO-5 questionnaire						
Instructions: Please indicate for each of the 5 statements which is closest to how you have been feeling over the past 2 weeks.						
Over the past 2 weeks…	All of the time	Most of the time	More than half the time	Less than half the time	Some of the time	At no time
1 … I have felt cheerful and in good spirits	5	4	3	2	1	0
2 … I have felt calm and relaxed	5	4	3	2	1	0
3 … I have felt active and vigorous	5	4	3	2	1	0
4 … I woke up feeling fresh and rested	5	4	3	2	1	0
5 … my daily life has been filled with things that interest me	5	4	3	2	1	0

Scoring principle: The raw score ranging from 0 to 25 is multiplied by 4 to give the final score from 0 representing the worst imaginable well-being to 100 representing the best imaginable well-being.

Fig. A.1. The World Health Organization-Five Well-Being Index (WHO-5) items

Table A.1
Sample characteristics, lifestyle habits and well-being during the COVID-19 lockdown (N = 3,109, unless specified)

	n (%)	Mean ± SD
Sociodemographic		
Age (Years) N: 3108		39.7 ± 14.1
Country		
Spain	2464 (79.3)	
England	402 (12.9)	
Ireland	243 (7.8)	
Area (Urban) N: 3077	2855 (92.8)	
Gender (Female)	2264 (73.0)	
Educational level (University)	2235 (72.0)	
Job status (Employed)	1525 (49.1)	
Life habits		
Physical activity during lockdown (Yes)	2524 (81.6)	
Alcohol consumption during lockdown (Increased)	683 (22.3)	
Smoking consumption during lockdown (Increased)	360 (11.8)	
Well-being		
WHO-5 (≤50) (Poor well-being) N: 3044	1797 (59.0)	
Possible presence of clinical depression		
WHO-5 (≤28) (Possible presence of clinical depression) N: 3044	810 (26.6)	
Outdoors contact		
Outdoor views help in coping with lockdown (0–10) N: 3068		6.3 ± 3.4
Importance of blue spaces during lockdown (0–10) N: 3067		7.9 ± 2.7
Importance of green spaces during lockdown (0–10) N: 3070		8.6 ± 2.2
Quality of view from home (0–10) N: 3072		5.8 ± 2.7
Use of outdoor spaces or window views (Yes) N: 3055	2568 (84.1)	
Nature element in home (Yes) N: 3072	2259 (73.5)	
View of green or blue spaces from home (Yes)	1512 (48.6)	

Table A.2

Bivariate analysis between socio-demographic characteristics, life habits and outdoors contact on well-being (N = 3,044, unless specified)

	Well-being		p-value
	Poor well-being (≤50)	Good well-being (>50)	
Sociodemographic variables			
Age N: 3043			
Years	37.6 ± 13.3	42.4 ± 14.4	**<0.001**
Country			
Spain	1523 (62.1)	928 (37.9)	**<0.001**
England	167 (47.2)	187 (52.8)	
Ireland	107 (44.8)	132 (55.2)	
Area N: 3014			
Urban	1653 (59.1)	1142 (40.9)	0.739
Rural	127 (58.0)	92 (42.0)	
Gender N: 3038			
Male	447 (54.3)	376 (45.7)	**0.001**
Female	1347 (60.8)	868 (39.2)	
Educational level N: 3038			
Primary schooling	34 (69.4)	15 (30.6)	0.352
Secondary schooling	90 (55.6)	72 (44.4)	
High school	378 (60.0)	252 (40.0)	
University	1292 (58.8)	905 (41.2)	
Job status N: 2998			
Employed	828 (55.4)	667 (44.6)	**<0.001**
Unemployed	194 (65.1)	104 (34.9)	
Student	422 (71.4)	169 (28.6)	
Retired/early retirement	67 (41.9)	93 (58.1)	
Homemaker	31 (59.6)	21 (40.4)	
Sick leave	60 (60.6)	39 (39.4)	
Furloughed	177 (58.4)	126 (41.6)	
Life habits during lockdown			
Physical activity N: 3040			
Yes	1411 (57.0)	1065 (43.0)	**<0.001**
No	384 (68.1)	180 (31.9)	
Alcohol consumption N: 3042			
None or decreased	974 (62.8)	578 (37.2)	**<0.001**
Same	414 (51.1)	396 (48.9)	
Increased	408 (60.0)	272 (40.0)	
Smoking consumption N: 3042			
None or decreased	1422 (57.9)	1033 (42.1)	**0.016**
Same	139 (60.4)	91 (39.6)	
Increased	235 (65.8)	122 (34.2)	
Outdoors contact			
Outdoor views help in coping with lockdown (0–10) N: 3040	5.7 ± 3.4	7.0 ± 3.1	**<0.001**
Importance of blue spaces during lockdown (0–10) N: 3039	8.0 ± 2.7	7.8 ± 2.8	0.211
Importance of green spaces during lockdown (0–10) N: 3042	8.6 ± 2.1	8.6 ± 2.2	0.255
Quality of view from home (0–10)	5.3 ± 2.7	6.5 ± 2.5	**<0.001**
Use of outdoor spaces or window views N: 3027			
Yes	1445 (56.8)	1097 (43.2)	**<0.001**
No	347 (71.5)	138 (28.5)	
Nature element in the home N: 3043			
Yes	1264 (56.6)	971 (43.4)	**<0.001**
No	532 (65.8)	276 (34.2)	
View of green or blue spaces from home			
Yes	782 (52.5)	708 (47.5)	**<0.001**
No	1015 (65.3)	539 (34.7)	

Declaration of competing interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this study.

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